BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

PATENT SPECIFICATION (11) 1 384 577

1 384 577

(21) Application No. 41419/72 (22) Filed 6 Sept. 1972
(23) Complete Specification filed 5 Sept. 1973
(44) Complete Specification published 19 Feb. 1975
(51) INT CL² B32B 3/16, 29/00, 31/18, 3/20, 3/22, 7/14
(52) Index at acceptance
B5N 0314 0316 0318 0320 0322 0714 2900 3118

(72) Inventor BRIAN KENNETH WOOLLARD

(19)

(54) SHEET MATERIAL

(71) We, REED INTERNATIONAL LIMITED, a British Company of 82 Piccadilly, London, W.1, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to sheet material and, more particularly, is concerned with a new sheet material and a method of manufacturing the same.

Single faced and double faced corrugated boards are well known. In single faced corrugated board a layer of fluted materiai is adhered to a flat ply, and in double faced corrugated board a flat ply is adhered on either side of a layer of fluted material. Both single faced and double faced corrugated reels and boards are commonly used as protective packaging for a wide range of products. While these corrugated reels and boards are entirely satisfactory for packaging they occupy a relatively large volume which makes transport of a roll of corrugated board from a manufacturer to a user expensive.

It is one object of this invention to provide a new sheet material which is capable of carrying out practically all the packaging functions of known corrugated board but since it occupies considerably less volume than a comparable quantity of corrugated board can be conveyed e.g. between a manufacturer and a user more economically. This is achieved by supplying to a user a roll of sheet material which is generally in the flat and which the user passes through a forming apparatus which acts on the sheet material to form a single faced, double faced or like corrugated board as desired.

According to one aspect of the invention there is provided sheet material comprising two substantially coextensive layers of material adhered together along a plurality of spaced apart generally parallel bands, one of said layers having cuts between and generally parallel to adjacent bands.

One or both layers may be a laminate comprising several sub-layers.

The cuts may be continuous or may be constituted by lines of perforations and they are preferably co-extensive with the adhesive bands.

For the packaging and wrapping industry, cardboard, paper and the like are all suitable for the construction of the layers. However, it is also contemplated that the sheet material will comprise, for example, resin impregnated fibre glass mat and combinations of foil and cardboard, and will be of use for example for making wall boards, plaster boards, acoustic boards and similar structural materials. Biaxially stretched polyethylene would also be suitable. The nature of further suitable materials will become apparent from the description with reference to drawings hereinafter.

It is contemplated that the sheet material hereinbefore defined will be delivered to a user in rolls with the adhesive bands and cuts extending longitudinally of the sheet material as it is removed from the roll.

The sheet material will then be passed through an apparatus which serves to lift the cut layer intermediate the adhesive bands from the other layer and turn it back to form flaps. The flaps on either side of an adhesive band are then brought together and secured preferably by adhesive.

To facilitate lifting the cut layers it is proposed to supply the sheet material with crease lines extending along each side of each adhesive band. The band itself is preferably an area over which the two layers are adhered together, the adhesive being applied either continuously or intermittently. It is believed that by providing a crease line along each side of the band the width of the band can be reasonable accurately controlled without using expensive

[Price 33p]

glues and glueing apparatus. It will, of course, be appreciated that the crease lines could be provided by the customer prior to lifting. However, in this case the advantage of controlling the width of the band would be lost.

After lifting, the two flaps on opposite sides of each band are brought together and secured preferably by glue. The glue may be applied by the user; however, it is proposed to supply the sheet material with a thin film of contact adhesive, for example latex, advantageously in a narrow band, disposed along both sides of the cuts on the cut layer. If desired, however, a heat sealable adhesive may be used for securing the two flaps together provided suitable means for applying heat is available.

It will thus be seen that in its basic formed-up shape the new sheet material comprises a single faced board having a layer of material upon which are mounted a plurality of generally parallel ribs or tubes of similar cross-sections. Whilst it is preferred that these cross-sections shall be of generally linear outline, it will be appreciated that one flap may overlap the other to form an approximately semicircular outline.

The tubes or ribs may be sandwiched between two layers of ply by adding a plain linear so as to form a double faced board. Alternatively, two single faced boards may be secured together with the ribs of one board lying between adjacent ribs on the other board.

The present invention also contemplates a sheet material having three superimposed layers, the first and second and the second and third layers being joined together along a plurality of spaced apart generally parallel bands, said first and third layers being cut between and generally parallel to the respective adjacent bands. This material can be formed up substantially in the manner described for single faced board except that a layer of ribs will be disposed on either side of the second layer. The ribs on the formed up material thus formed can then be faced to produce double thickness corrugated board.

It should be noted that in the case of manufacture of single faced boards from sheet material according to the invention the total amount of material used may be less than in producing single faced corrugated boards since in the first case the layers need only be of the same areas whereas in the case of corrugated board, the corrugated layer is necessarily of greater area than the lining layer to which it is attached.

The present invention also provides a method of forming sheet material in which two substantially coextensive layers of material are adhesively secured together along a plurality of spaced apart generally parallel bands and in which one of the layers, either before or after the layers are adhesively secured together, is cut between and generally parallel to adjacent bands.

For a better understanding of the invention, reference will now be made, by way of example, to the accompanying drawings, in which:—

Figure 1 is a fragmentary view of a two ply web prior to cutting and creasing;

Figure 2 is a fragmentary view of a sheet of material in accordance with the invention formed by cutting and creasing the web shown in Figure 1;

Figure 3 shows the sheet of material after passing through an adhesive applicator;

Figure 4 shows the sheet of material of single faced ribbed form after passing through a forming-up machine and ready for use;

Figure 5 is a fragmentary view of a web of three plies prior to cutting and creasing;

Figure 6 is a fragmentary view of another sheet of material in accordance with the invention formed by cutting and creasing the web shown in Figure 5;

Figure 7 shows the sheet of material after passing through an adhesive applicator;

Figure 8 shows a sheet of material of double ribbed form after passing through a forming-up machine;

Figure 9 shows a double faced board formed by combining two formed-up sheets of material as shown in Figure 4; and

Figure 10 shows a board of double thickness formed by applying plies to both sides of the formed sheet of material shown in Figure 8.

Referring to Figure 1 of the drawings, there is shown part of a web 1 which is being fed to a cutting and creasing apparatus (not shown) in the direction of the arrow A. The web 1 comprises two layers of card or suitable kraft paper 2 and 3 which are adhered together along two generally parallel bands or strips 4 and 5 of uniform transverse width using a suitable adhesive.

As the web 1 is passed through the cutting and creasing apparatus the upper layer 2 is cut along lines 6 and 7 intermediate adjacent bands of adhesive. The web 1 is also creased along lines 8 and 9, 10 and 11, which are disposed respectively to either side of bands 4 and 5. The sheet material thus formed is shown in Figure 2. In this condition the sheet material either flat or in rolls may be transported to customers to be formed into ribbed or corrugated board on the customers premises. It is however preferred to apply one more production step to the material before supplying it to a user. Accordingly narrow strips of a contact adhesive 12 and 13, for example latex, are

applied to the upper layer 2 along and on both sides of the cut lines 6 and 7 by an adhesive applicator (not shown). The upper layer 2 between the cut lines 6 and 7 is thus made up of three sections, viz a central section 14 which is securely adhered to the lower layer 3 and two flaps 15 and 16, one on each side of the adhesive, which extend outwardly from crease lines 10 and 11 respectively.

The sheet material shown in either Figure 2 or 3 can be stored in rolls prior to forming up. The sheet material prior to forming up is herein referred to as being "in the flat".

If the sheet material is to be stored, for example for a long period of time before forming-up, or if it is to be stored in dusty or humid conditions it is preferably stored in rolls in the condition shown in Figure 2. If however, it is intended to form up the sheet material in, for example 6 months and the rolls can be kept relatively clean and dry the sheet material is preferably stored in rolls in the condition shown in Figure 3. Clearly in the form shown in Figure 3 the material can be delivered to a customer for immediate use.

In order to form up the sheet material shown in Figure 3, the material is passed through apparatus having a number of ploughs of a kind known per se in paper conversion. Each plough is arranged so that its leading edge enters the material at the respective cuts 6, 7, and as the material moves past it is caused to fold about crease lines 8, 9, 10, 11 upwardly until the flaps meet. The layers of contact adhesive which can be urged together by a presser member associated with the plough secure the upper edges of the flaps together to form a generally triangular rib as shown in Figure 4.

It will be appreciated that in the case of the sheet material shown in Figure 2 being sent to a user the latter would need to apply the adhesive to the edges of the flaps either just prior to forming-up or alternatively during forming up.

Referring to Figure 5 of the drawings, there is shown part of a web 20 which comprises an upper layer 21, an intermediate layer 22 and a lower layer 23. The upper layer 21 and the intermediate layer 22 are adhered together along generally parallel spaced bands 24 and 25, and the intermediate layer 22 and the lower layer 23 are adhered together along generally parallel spaced bands 26, 27 and 28 which are interdigitated with bands 24 and 25.

The upper layer 21 and lower layer 23 of web 20 are cut along lines 29 and 30 and 31 and 32 respectively, and creased along lines 33—41 as shown in Figure 6 in a manner similar to that described with reference to Figures 1 to 3.

Narrow bands of contact adhesive 42, 43, 44 and 45 (Fig. 7) are then applied over the cut lines 29, 30; 31, 32 in a manner similar to that described with reference to Figure 3.

This sheet material of Figure 7 is then formed-up by using ploughs on each side of the material to produce a double sided ribbed sheet material as illustrated in Figure 8.

Figure 9 shows a double faced board formed by combining two formed-up sheets of material as shown in Figure 4 in face to face position with the ribs in each sheet intermediate each other. The apices of the ribs will be glued to the adjacent sheet as indicated at 46, 47 and 48. Similarly Figure 10 shows a board formed by glueing a layer, 49 and 50, to each side of the packaging material 51 shown in Figure 8.

It will of course be appreciated that instead of using a layer 49 and 50 in the embodiment shown in Figure 10, the formed-up sheet of material shown in Figure 4 could be used with the ribs being positioned intermediate the ribs on the packaging material 51.

It will be seen that we have provided an improved sheet material usable for manifold packaging purposes which material can be manufactured for no greater cost than known corrugated board but which due to its construction can be delivered to customers more readily and cheaply since, per area of material, it occupies less space.

WHAT WE CLAIM IS:—

1. Sheet material comprising two substantially coextensive layers of material adhered together along a plurality of spaced apart generally parallel bands, one of said layers having cuts between and generally parallel to adjacent bands.

2. Sheet material as claimed in claim 1 wherein said one layer has cuts along continuous lines between adjacent bands.

3. Sheet material as claimed in claim 1 wherein said one layer has cuts formed by perforations.

4. Sheet material as claimed in any preceding claim wherein said one layer has a crease line between and generally parallel to each cut and adjacent band.

5. Sheet material as claimed in any preceding claim wherein adhesive is applied to said one layer over said cuts on its opposite surface to said bands to facilitate the formation of ribs when the edges of the cuts in said one layer are lifted away from the other layer.

6. Sheet material as claimed in any preceding claim wherein one of said layers comprises a plurality of sub-layers.

7. Sheet material as claimed in any preceding claim when formed-up to form single faced ribbed sheet material.

8. Sheet material as claimed in claim 7 adhered to a generally plain sheet to form

double faced ribbed sheet material.

9. Sheet material as claimed in claim 7 adhered to another sheet material as claimed in claim 7 with the ribs of one sheet material intermediate the ribs of the other so as to form double faced double-thickness ribbed sheet material.

10. Sheet material as claimed in any of claims 1 to 6 comprising three parallel layers of material, the outer two layers being respectively adhered to the central layer along a plurality of spaced apart generally parallel bands, each of said outer two layers having cuts between and generally parallel to adjacent bands.

11. Sheet material as claimed in claim 10 wherein the bands along which one of said outer layers is adhered to said central layer are substantially opposite the cuts in the other of said outer layers.

12. Sheet material as claimed in claim 10 or 11 when formed-up to form a ribbed sheet material.

13. Sheet material as claimed in claim 12 adhered between two generally plain sheets so as to form a double faced ribbed sheet material.

14. A method of forming sheet material in which two substantially coextensive layers of material are adhesively secured together along a plurality of spaced apart generally parallel bands and in which one of the layers, either before or after the layers are adhesively secured together, is cut between and generally parallel to adjacent bands.

15. Sheet material substantially as hereinbefore described with reference to Figures 2, 3, 4, 6, 7, 8, 9 or 10 of the accompanying drawings.

For the Applicants,
FRANK B. DEHN & CO.,
Imperial House,
15—19 Kingsway,
London, WC2B 6UZ.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1975.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1384577 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG.1.

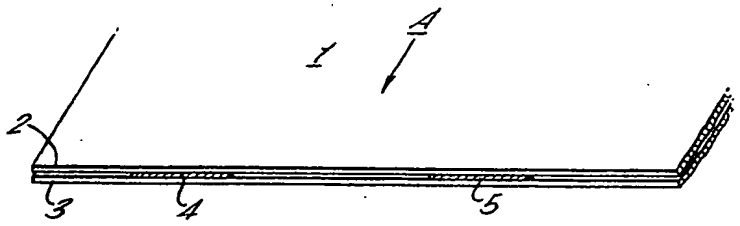


FIG.2.

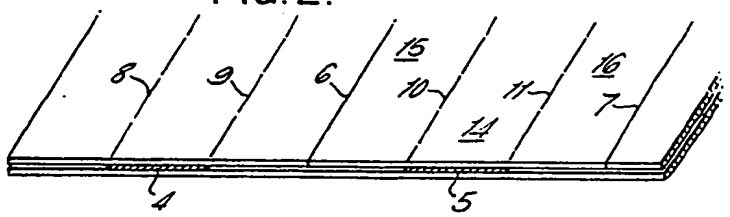


FIG.3.

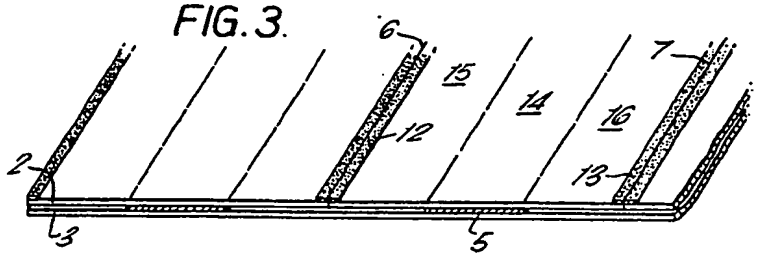


FIG.4.

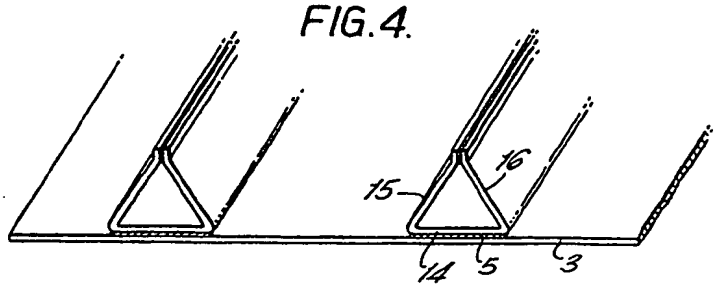


FIG.5.

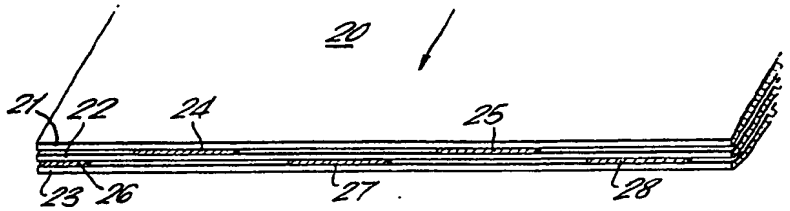


FIG.6.

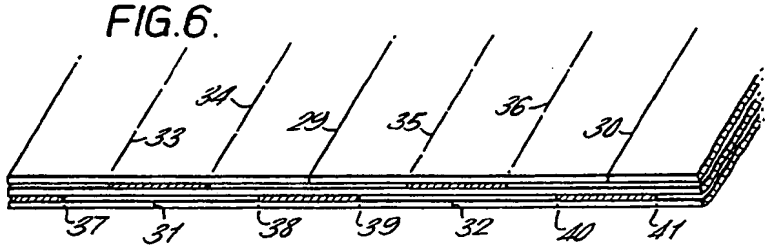


FIG.7.

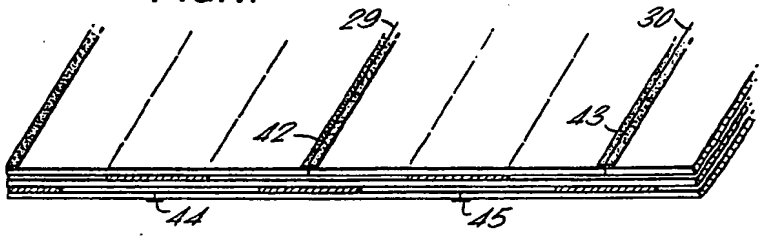
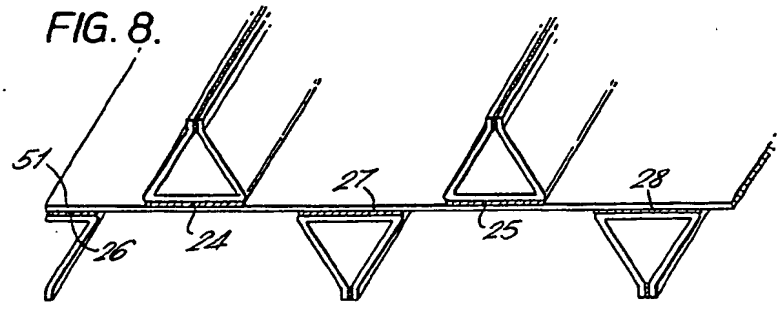


FIG.8.



1384577 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3

FIG. 9.

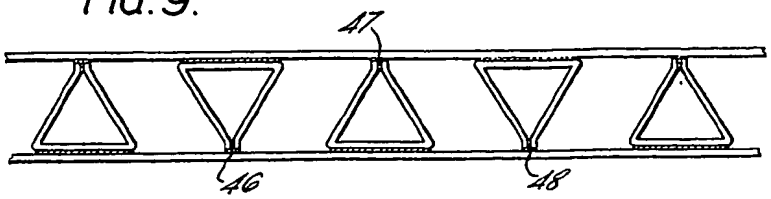


FIG. 10.